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EDITORIAL—COLLECTING BEETLES IN EXOTIC PLACES WITHOUT LEAVING HOME: THE HERBARIUM[1]

John Colburn Bridwell (1932, J. New York Bot. Garden 33:105-109) long ago published a note on collecting beetles, especially bruchids, in herbaria. This technique needs to be re-emphasized, as a means for gathering much needed complementary data on poorly known groups.

Many bruchids and weevils, and some other groups of Coleoptera and certain other insect groups, leave not only traces of their activity on herbarium specimens but may themselves still be present. Among beetles that attack fruits and flower buds, some leave the food source to pupate in the ground, hence leaving little or no useful, recoverable trace on the herbarium specimen. Others, however, pupate *in situ*; and it is for these that I have found the herbarium a useful—and much neglected—resource.

Recognition. Generally, a distinctive exit hole is prepared, either by larva or adult, before emergence. Frequently, for some reason, the adult has not yet emerged; it may have been physiologically unable to do so, or it may have been trapped during preparation of the plant specimen. In general, unless seeking expected clues, I scan the herbarium sheets quickly; thus, when I do find an infested plant specimen, it is likely to be heavily infested and therefore contain several individuals including fully developed adult males (the most valuable for taxonomic purposes).

Occasionally, plant specimens may be found with emergence holes but no visible beetles, yet specimens are badly needed. In such instances, as with legumes, it may be possible to find infested seeds containing unemerged adults by pinching the apparently intact seeds, or it may be possible to detect seeds containing beetles because of thinned, discolored patches on the seed coat.

[1]Work carried out under support of D. H. Janzen's NSF Grants GB35032X and BMS 75-14268.

Handling the herbarium material. Herbarium materials are valuable and expensive properties, and must be handled carefully, with permission of the responsible curator. If I find a specimen with visible beetle damage, I look first to the customary pocket on the sheet that contains disassociated plant parts. If there is nothing there, I turn next to the prepared specimen, examining it by microscope for beetles. If seeds or flower buds are well represented, I remove those few of concern to me; if there are few seeds or buds, then I carefully dissect out the beetle, leaving the dissected fruit or bud in a paper pocket associated with the herbarium specimen.

On removal of beetle specimens from the herbarium specimen, an annotation label should be attached to the sheet; this label should later be updated with the correct name of the insect once it is identified. This information may be highly appreciated by the next botanist to examine the herbarium material.

Recording data. In addition to the usual data—locality, date, collector, ecological data, host—one should be sure to record the collector's voucher number. Then, it becomes possible to trace the host plant of a beetle even following changes of name of the host plant or redetermination of the herbarium specimen; the collector's voucher number is the number that is frequently cited in botanical literature. Another advantage of recording this data is that plant specimens are frequently separated and distributed to various herbaria, and with the voucher number it may be possible to trace additional beetle specimens in other herbaria if needed.

Significance. The usefulness of obtaining material in this way is diverse. For tropical beetles, especially, host data are unavailable for most species; from the herbarium specimen we obtain precise host data, associated moreover with voucher material. We may need collaborative data to verify a specimen record; the herbarium may provide an immediate, positive answer. Or we may need to learn something about whether a particular beetle species has relatives in related host plants.

Level of success. One should not expect to find material quickly and easily; hours may pass before success is met. Various factors are involved. The seeds, flower buds, or other plant parts may not be fully ripened, or may have passed their prime. Not all specimens will have an infestation. Botanical collectors are likely to avoid infested specimens. Museum pests may have entered the herbarium and destroyed beetles that may have been there. But, even if it does take some hours to obtain a piece of information, it is more economical to do so from the herbarium than to mount an expensive expedition to some far off land—and success is just as probable.

Some examples. I have used this collecting technique on numerous occasions, first to obtain complementary data on bruchids and, more recently, on weevils. In revising the weevil genus *Rhinochenus,* I (1976, Quaest. Ent. 12:118-201) discovered 2 old specimens that were labelled as from *Copaifera,* whereas all other host records for the genus were from *Hymenaea.* A check of the herbarium confirmed that 1 species of *Rhinochenus* is indeed a seed predator of various *Copaifera,* as I found exit holes on 1 herbarium specimen and actual fragments of the weevil on another.

I am spurred to write this note because in some current studies on another weevil genus, *Apion,* I had material reared from 2 species of *Lonchocarpus* fruits and another from *Pterocarpus* fruits. These plant genera are members of the tribe Dalbergieae *s. l.,* among which the only other records of predation by *Apion* known to me are by the large *A. samson* in fruits of *Andira* (D. H. Janzen, pers. comm.) and by another *Apion* in flowers of *Dalbergia* (D'Araujo e Silva *et al.* 1968, Quarto catalogo dos insetos que vivem nas plantas do Brasil). From a survey of Dalbergieae in the National Herbarium, I obtained additional records of *Apion* from flower buds of *Lonchocarpus, Pterocarpus, Machaerium, Geoffroea,* and *Dipteryx,* and from fruits of *Machaerium.* These will enable me to paint a more accurate picture of host and beetle relationships. The weevils found in flower buds of *Pterocarpus* and in fruits of *Machaerium* are particularly interesting, apparently closely related to one of the weevils reared from fruits of *Lonchocarpus.*

Above all, I want to emphasize here that the technique of collecting in herbaria is not only richly rewarding to all concerned, but also is fun. How else can I collect beetles in Guatemala, Venezuela, and Brazil all in the same day?

I am indebted to Bridwell's paper and to J. M. Kingsolver for introducing me to herbarium collecting; to my artist and technician, Candy Feller, for assistance in searching herbarium materials; and to W. E. Clark and D. H. Janzen for criticism.

—D. R. Whitehead